

## ***FOOD PROCESSING END USE EFFICIENCY: RD&D***

CIFAR assisted CEC to identify RD&D targets that could benefit California's food processing industry in a competitive energy market.

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Two focus group meetings were held in 1998, one at UC Davis and the other Cal State Pomona. Each involved participants from industry, academia and government.

Discussion and prioritization of key problems and potential solutions linked to energy led to the conclusion that energy reliability and efficiency are important future issues

# FOOD INDUSTRY ADVISORY COMMITTEE

comprises

SCE, PG&E, SMUD

CLFP, NFPA, IFCPA, CDRF, R&D,

Fruit processing

Fruit and vegetables

Vegetables-onion, garlic

Almonds

Grain processing

Poultry

Meat

Tomato

Cheese

Fluid milk, dry solids

Wine

Experts: freezing, dehydration, fruit and vegetable,

# FOOD INDUSTRY ADVISORY COMMITTEE

- Met in Nov 2001 and Feb 2002
- Discussed issues, suggestions for vision, mission statement, targets and prioritized targets
- Discussed energy distribution within specific sectors

# *A Vision...*

- Vision  
Continuously improve the global competitiveness of a global food industry



**Breakout in  
defined direction**

## Roadmap Concepts

- Begin to identify the major “highways” that fit with the visionary direction.
- Identify the hurdles, limitations and needs to go from here to there.
- Place priorities on building these the appropriate and most effective routes.  
(highways versus minor roads)

# Roadmap Framework

## Mission Statement

Manage energy and other resources to meet or exceed all standards and benchmarks

## Direction

To improve energy and productivity efficiencies and reduce water use

## Targets

To provide cost savings with payback within 2 years

## ***PRIORITY ISSUES (key problem areas)TURNED INTO TARGETS***

- 1. Water use**  
Reduce water requirements and water waste
- 2. Technology validation**  
Validate existing technologies in a process setting
- 3. Food process modification and its affect on energy and safety**  
Determine effects of processing alternatives and energy impact on food safety systems
- 4. Temperature management between producer and end user**  
Reduce losses due to lack of temperature management between producer and end user
- 5. Total product utilization**  
Develop total product utilization, including byproduct utilization
- 6. Dehydration inefficiency**  
Improve dehydrator efficiency
- 7. Complexity and inefficiency of seasonal labor**  
Develop seasonal infrastructure for improved energy efficient processing

# 1. WATER USE

Reduce water requirements and water waste

Lots of water is required in many processing operations. The availability of water and costs associated with effluent water treatment are issues.

## Targets:

- Reduce energy in evaporation of foods
- Separate dissolved and suspended solids from effluent water within process line and at end of pipe

## Approaches:

- Examine benefit of redirecting water, bypassing municipal facilities
- Evaluate membrane filtration alone and in combination with pre- and post-treatment technologies
- Develop more efficient membrane designs to integrate water and energy to recover valuable solids and reuse water within plant
- Evaluate ozone to augment use of chlorine for microbial control
- Develop more versatile membrane modules (high T, P, pH and solids, and low cost)
- Increase investment in drinking and waste water treatment facilities



## 2. TECHNOLOGY VALIDATION

Demonstration of technical and cost effectiveness of new technology in food processing operations have been shown to accelerate its adoption (e.g., membrane filtration, ozonation, and aseptic processing.)

### Targets and Approaches:

- Apply separation technologies that are used in other industries
- Adapt equipment through interactions with suppliers, manufacturers
- Provide cost/benefit index to industry for new and existing technology and equipment
- Develop low-quality energy recovery processes (e.g. heat pumps)
- Establish a central screening and demonstration facility to provide specific data to companies on new emerging technologies
- Transfer technology through education and demonstration
- Establish training and education programs
- Leverage state and federal funding to advance new technology
- Transfer industry experience on state-of-the-art motor technology

### 3. FOOD PROCESS MODIFICATION AND ITS AFFECT ON ENERGY AND SAFETY

Food safety is key issue with global sourcing of food and ingredients, new practices (fresh cut, minimal packaging). Handling of food can be problematic and new standards are in effect. Automated processing lines with sensors and feedback control is becoming more competitive.

#### Targets:

- Integrate post harvest treatment and management of food supply
- Develop system for ethylene removal
- Replace refrigerants
- Evaluate consequences of using new technology and sanitation

#### Approaches:

- Integrate pest management strategies
- Evaluate new preservation technologies
- Develop disease-resistant crops and insect-resistant crops
- Alternative sterilization for operational efficiency and food safety

## 4. TEMPERATURE MANAGEMENT BETWEEN PRODUCER AND END USER

Need to improve the "cold chain" from harvest to retail. Approximately 27% of products are lost in retail due to improper temperature control.

### Targets and Approaches:

- Ensure retail chillers are maintained at 55F by replacing old chillers
- Improve transport refrigeration and distribution centers by implementing monitoring and control systems and develop technologies and sensors to control relative humidity
- Disseminate information in public forums
- Develop highly efficient refrigerants & compressors for heat removal
- Improve freezer operations (spiral configurations)
- Minimize peak rates for electricity
- Improve temperature control
- Improve facility design by improving efficient, multi-state cooling
- Utilize waste heat
- Control temperature in distribution chain
- Develop software to integrate and optimize container equipment

## 5. TOTAL PRODUCT UTILIZATION

Need to integrate components of the system from farm to consumer in order to maximize use for byproducts. Need to Redesign processes to eliminate waste and recover potential "co-products".

### Targets and Approaches:

- Evaluate use of incineration for energy generation
- Examine potential for isolating food/feed components and pharmaceutical components from byproducts
- Improve separations of lq-lq and lq-solid streams to add value by highlighting functionality of co-products
- Develop new uses for byproducts
- Integrate new and cost effective separations with applications of byproducts
- Re-examine processes with attention to waste utilization systems approach
- Expand CA Integrated Waste Management Board Resource report/publicize
- Reduce volume of wastes by solid-lq separation and fractionation
- Demonstrate transfer of technology
- Utilize and/or develop new software to manage new inventory/replacements
- Establish training and education programs
- Evaluate equipment used in processing on basis of energy, water and waste

## 6. DEHYDRATION INEFFICIENCY

Dehydrators typically customized for one commodity  
Old technology, mostly electrically driven dehydrators  
In central valley, over 3,000 tunnel dryers and drying  
accounts for 20-60% of cost of end product

### Targets:

- Improve and maximize energy efficiency of of dryers
- Improve and maximize utilization of capital investment
- Focus on process control (e.g. moisture sensors)
- Provide training forums to educate operators
- Assist in the transfer of promising new technology

### Approaches:

- Share equipment amongst commodities
- Adopt automatic control devices and monitoring systems
- In addition, maximize the use of lower air temperatures
- Retrofit existing equipment
- Use zone drying
- Optimize process using control sensors for T, humidity and time
- Develop standard methods and monitor results

## 7. COMPLEXITY AND INEFFICIENCY OF SEASONAL LABOR AND INFRASTRUCTURE

Lack of infrastructure and hardware in seasonal industries

Targets and Approaches:

Shared facilities and equipment between operations to extend season

Link energy management with food and beverage processing

Need infrastructure to link energy management systems to hardware

Need connections with companies using similar infrastructure, yet different time of manufacturing in order to share infrastructure and equipment

Need to improve product quality in a seasonal process (modeling).

# ***Food Processing Technology Roadmap***

## **Key Technology Areas**

**Water Management**

**Waste Minimalization**

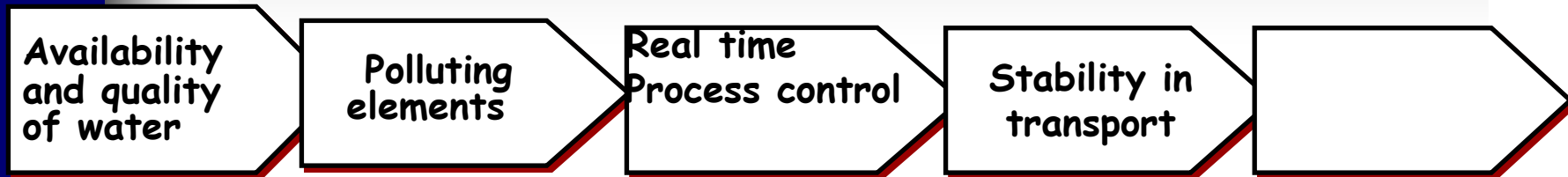
**Processing**

Economic processing of diverse  
raw materials toward zero  
discharge

**Infrastructure and Transportation**

Consistent product

# Key Barrier Areas need to be Identified in the context of issues



Economics Control separations infrastructure Composition	Economics Consistency Infrastructure	Economics Separations Conversion  Infrastructure	Economics Functionality Performance Unique Markets	Price/value Performance Consumer Alliance to prod
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